

CONSERVATION PRACTICE STANDARD

SINKHOLE AND SINKHOLE AREA TREATMENT

(Acre)

CODE 527

DEFINITION

A method of treating sinkholes and sinkhole areas to reduce contamination of ground water resources, and/or improve farm safety.

PURPOSE

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- Improve water quality
- Improve chemical and nutrient management within sinkhole watersheds
- Reduce soil erosion within sinkhole watersheds
- Improve farm safety

CONDITIONS WHERE PRACTICE APPLIES

On any agricultural land surface or existing practice where the soils and geologic conditions have led to the development of sinkholes. Also where contaminated surface water and other material have the opportunity to enter sinkholes and pollute the ground water resource.

CRITERIA

General Criteria Applicable To All Purposes

The installation and operation of sinkhole treatment(s) will comply with all federal, state, and local laws, rules, and regulations.

Provide for public safety in and around sinkholes.

Trash and other material will be removed from the sinkhole and disposed of in an environmentally sound manner, as directed in

conservation practice standard Obstruction Removal (PA-500).

Excess surface water caused by construction activities will be diverted from the sinkhole area.

Nutrient and pest management plans will be developed for the drainage area of the sinkhole controlled by the landowner.

Additional Criteria Relating for Treatment of Sinkholes

Adequate protection of some sinkhole and sinkhole areas can be achieved by the use of vegetated buffers and livestock exclusion. However, if an open sinkhole is a safety hazard, it should be treated with a rock filter, earth fill, or other methods approved by the State Conservation Engineer.

Sinkholes that open into caves shall not be filled unless bat-friendly openings are provided. Gated openings may be used for safety reasons.

Sinkholes that serve as outlets for karst basins should only be protected by use of filter strips, riparian forest buffers, fencing, and other similar practices.

Sinkhole Closing. Standard Drawings NRCS PA-073, PA-074, and PA-075 provide guidance for designing a pervious cover, soil cover, and an impervious cover, respectively, for sinkholes. These drawings may be adequate for many situations, however special conditions may require a site-specific design.

Vegetative Treatment. All sinkholes treated with a vegetated treatment shall have a vegetated buffer, minimum of 25 feet wide, measured from the rim of the sinkhole. The buffer area should be extended to control concentrated flow channels entering the sinkhole. The width of the vegetated buffer will

be established and maintained in accordance with the type of buffer chosen. The sinkhole and surrounding buffer shall be fenced.

Livestock will be excluded from the vegetated buffer except where applicable for maintenance purposes.

Nutrients, herbicides, pesticides, and animal waste will not be applied within an established buffer. Only mechanical treatments shall be used for weed control.

Appropriate erosion and sediment control measures will be used to reduce the amount of sediment entering sinkhole openings during the establishment of the vegetated buffer.

Additional Criteria for Surface Water Control

Changes to the volume of surface water that enters a sinkhole may disturb the underground hydrology. To the extent possible, the surface water flow should be maintained at historic (or predevelopment) volumes.

Perennial flow channels will be stabilized but should not otherwise be altered. If a plug or inverted filter is used for perennial flow channels, the area to be protected should be characterized by a qualified geologist.

Concentrated flow caused by the construction activities will be dispersed with a suitable spreading structure.

Additional Criteria for the Establishment of Vegetation

On disturbed areas and/or sinkholes (as applicable), determine the appropriate vegetation to be established based on site conditions and planned land use. Follow the conservation practice standards for Conservation Cover (PA-327), Critical Area Planting (PA-342), Riparian Herbaceous Cover (PA-390), Riparian Forest Buffer (PA-391), or Pasture and Hay Planting (PA-512), as appropriate.

When a grassed filter area is required around the sinkhole, follow the Filter Strip Standard and Specification (PA-393).

Do not use plants listed on the Pennsylvania noxious weed list. Schedule construction so that completion occurs during periods suitable for the establishment of vegetation.

CONSIDERATIONS

The practice should work in conjunction with conservation cropping systems, pest and nutrient management, and practices that control sheet, rill and gully erosion.

Current and planned land use should be considered. In particular, structures, septic fields, wells, feedlots, ponds, and animal waste storage systems should not be located over a sinkhole site or within the impact area.

The sinkhole treatment should not result in surface water ponding or high soil moisture conditions over an extended period of time.

The treatment should be planned with consideration given to the following:

- Land use
- Existing and planned land treatment.
- Sinkhole drainage area.
- Dimensions of sinkhole opening.
- Safe outlet for diverted surface water.
- Environmentally safe disposal site for sinkhole "cleanout" material.
- Availability and quantity of inverted filter material.
- Safety of equipment operators and laborers during practice installation.

Caution should be taken when working around or operating equipment near the rims of active unstable sinkholes.

For a sinkhole receiving contaminated overland flow, every effort should be made to first treat the source of contamination. Although it is important to maintain the hydrology of the karst system, it may be more beneficial to the ground water quality to divert the contaminated water away from the sinkhole. When diversion of contaminated water is impractical, it may be necessary to completely plug a sinkhole with sealing materials rather than treat it with a filter. The contaminated water could then be treated. An example of this would be a sinkhole in a feedlot or other site that is difficult to protect by any other method.

Treatment of one sinkhole may have an effect on other sinkholes or solution features in the vicinity.

The use of a Conservation Easement for the buffer and sinkhole should be considered.

PLANS AND SPECIFICATIONS

Plans and specifications for Sinkhole and Sinkhole Area Treatment will be in keeping with this standard and will describe the requirements for applying the practice to achieve its intended purpose.

- Plan view showing sinkhole and sinkhole area. Include topographic information and photographs.
- The geologic investigation will include a study on the potential impacts on the karst resource (if needed).
- Delineated drainage area of the sinkhole on a topographic map.
- Planned treatment measures.
- Availability of safe outlet for surface water, if applicable.
- Operation and Maintenance requirements.
- Special safety requirements.
- Environmental Assessment, if applicable.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall provide specific instructions for maintaining the sinkhole and sinkhole area treatment, including reference to periodic inspections and the prompt repair and/or replacement of damaged components.

At a minimum, the following items shall be included in the O & M plan, as applicable:

1. Inspection of the treatment should be made after periods of heavy runoff, since some material may run further into the sinkhole voids causing a surface depression. In this case, maintenance will include adding soil material to the surface.
2. Appurtenances such as filter strips, diversions, structures, and other

conveyance systems shall be kept free of trash and repaired when needed.

3. Mow herbaceous plantings as necessary to promote vigorous growth.
4. If fences are installed, they should be maintained to prevent unauthorized entry.
5. Maintain all safety practices associated with sinkholes.

REFERECES

Koerner, R.M. Designing with Geosynthetics, Prentice-Hall, Englewood Cliffs, NJ, 1985.

National Crushed Stone Association. Graded Riprap Stone, Quarried Stone for Erosion and Sediment Control, June 1978

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USDA-NRCS. Urban Hydrology for Small Watersheds, Technical Release 55, June 1986.

White, W.B. Geomorphology and Hydrology of Karst Terrains, Oxford University Press, Inc., New York, NY. 1988.